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INTRODUCTION

Vermiform appendix is a vestigial part of small intestine in human beings. It's supposed to be non-functional part of gut, despite it contains a lot of lymphoid tissue that plays role in mucosa surface immunity. Vermiform appendix may get infected by micro organisms. Inflammation of vermiform appendix is termed as appendicitis that may be acute or chronic.¹ Acute appendicitis presents as acute surgical abdomen with nausea and vomiting being the prominent features beside pain. Pain usually arises in the right iliac fossa. Acute appendicitis is a cause of emergency hospitalization and appendectomy is commonly performed surgical procedures.² Children and adolescents are prone to acute appendicitis. Reported prevalence is approximately 7% during life time of a person.³ Incidence of acute appendicitis peaks in the late teens and twenties. Occlusion of appendicular lumen is major factor in pathogenesis of acute appendicitis. Lymphoid hyperplasia, fecolith, mucocele, tumors, helminthes and granulomatous diseases are few causes of lumen occlusion.⁴ Pre-operative

APPENDECTOMY; UNUSUAL INCIDENTAL HISTOPATHOLOGICAL FINDINGS IN APPENDECTOMY SPECIMENS

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ABSTRACT... Objectives: Investigating unusual incidental findings in appendectomy specimens by histopathological examination. **Study Design:** Observational study. **Place & Duration:** Department of Pathology, Liaquat University of Medical and Health Sciences from January 2014 to March 2016. **Subjects & Methods:** 300 appendectomy specimens were investigated. Biodata of patients on Pathological proforma and specimens was noted. 3- 5 μ tissue sections of appendectomy were stained with H & Eosin stain for microscopy. Data was analyzed on SPSS version 22.0 (USA) at 95% CI ($P \leq 0.05$). **Results:** Male to female ratio was 3.61:1 ($P=0.0001$). Mean (\pm SD) age was 19.5 ± 5.7 years. Acute appendicitis was noted in 57.66% of specimens. Unusual histopathological findings noted were adenocarcinoma, endometriosis, Crohn`s disease, carcinoid tumors and Enterobius vermicularis. **Conclusion:** Unusual incidental findings emphasize the importance of histopathological examination of appendectomy specimen for proper diagnosis and timely intervention.

Key words: Appendectomy, Histopathology, Adenocarcinoma, Endometriosis, Crohn`s Disease.

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diagnosis acute appendicitis is a surgical dilemma because it is diagnosis of exclusion.⁵ Clinical signs and symptoms supported by leukocytosis may help diagnosis. Appendicitis continues to be a clinical diagnosis despite advancement in the medical imaging. Classical cases are diagnosed clinically. Atypical clinical presentation continues to be major cause of negative appendectomy. Appendectomy is a preferred surgical procedure to prevent acute complications of perforation, peritonitis, septicemia, septic shock and death. Early clinical diagnosis and surgical procedure may beget negative appendectomies.⁶ All of appendectomy specimens must be analyzed by microscopy by a histopathologist to reach to proper diagnosis and exclude the malignancies. Our institute has policy of each appendectomy specimen should be screened by histopathology. Our tertiary care hospital caters a large number of surgical appendectomies. Pathology department gets hundreds of appendectomy specimens a year.^{7,8} The present observational study was conducted prospectively to investigate the unusual incidental histopathological findings in

appendectomy specimens.

SUBJECTS AND METHODS

Ethical permission for the prospective observational study was taken from the institutional ethics committee. Pathology Department receives many appendectomy specimens from the surgical wards which are the busiest with hundreds of appendectomy surgeries per annum. Appendectomy specimens are received preserved in formalin containers and filled Pathological proforma showing details of patient's problems and biodata. The present study selected 300 appendectomy specimens according to inclusion criteria. Appendectomy specimens of acute, chronic and/or recurrent appendicitis were included irrespective of age, gender and cause. Specimens not properly labeled were excluded from study protocol. Surgical wards were informed about the protocol of tagging the specimens properly.

A sample of 300 appendectomy specimens, showing complete data and biodata of patients, were investigated by microscopy at the Department of Pathology from January 2014 to March 2016. Gross examination was conducted, followed by microscopic study. Appendectomy tissue of 3- 5 μ thickness was stained with Hematoxylin and Eosin (H & E) for microscopic examination. Consent of volunteer subjects was not necessary for the present study. However, prior ethical permission was taken. A pre- structured proforma was designed showing details of research variables. Microscopic findings were noted in pre- structured proforma for each specimen separately. Proforma was designed and approved by mutual consent of authors. Confidentiality of data was strictly maintained. A proper chain of confidentiality of patient's data was maintained by securing the proforma in lockers. Access was only for the authors conducting the research. Lockers were properly tagged showing the confidentiality so that others were not allowed.

Authorized researchers had access to the microscopic findings and biodata of patients. Data variables were analyzed on SPSS 22.0 version

(IBM, Incorporation, USA). Data was analyzed by Student's t-test (continuous variables) and Chi-square test (categorical variables). Alpha level of significance was taken at 95% confidence interval ($P \leq 0.05$) for the statistical significance.

RESULTS

Of total 300, male and female were 235 (78.33%) and 65 (21.66%) respectively ($P=0.0001$). Male to female ratio was 3.61:1. Mean (\pm SD) age was 19.5 ± 5.7 years. Approximately 213 (71%) belonged to second decade, 57 (19%) to 3rd decade and 30 (10%) belonged to fourth decade of life ($P=0.0001$). Spectrum of histopathological lesions is shown in Table-I. Acute, sub- acute, chronic, recurrent, obliterative, suppurative, and gangrenous appendicitis were noted in 57.66%, 4.33%, 8.66%, 3.33%, 11.3%, 7.66% and 7.66% of cases respectively. Peri-appendicitis was noted in 21.66%, perforation in 25.33%, lymphoid hyperplasia in 15.66%, granulomatous inflammation in 12.33% and fecolith in 34.33% of cases respectively. Benign and malignant tumors were noted in 4.33% and 6.66% of cases respectively. Mucocele, Crohn's disease, carcinoid tumors, adenocarcinoma, endometriosis and Enterobius vermicularis were noted in 7.6%, 6%, 1.66%, 1.0%, 3.66%, 1.33% and 6.33 of cases respectively.

	No.	%
Acute appendicitis	173	57.66
Sub acute appendicitis	13	4.33
Chronic appendicitis	26	8.66
Recurrent appendicitis	10	3.33
Obliterative appendicitis	34	11.3
Suppurative appendicitis	23	7.66
Gangrenous appendicitis	23	7.66
Peri-appendicitis	65	21.66
Perforation	76	25.33
Granulomatous inflammation	37	12.33
Lymphoid hyperplasia	47	15.66
Fecolith	103	34.33
Benign tumors	13	4.33
Malignant tumors	20	6.66
Mucocele	23	7.66
Crohn's disease	5	1.66
Carcinoid	3	1.0
Adenocarcinoma	11	3.66
Endometriosis	4	1.33
Enterobius vermicularis	19	6.33

Table-I. Spectrum of histopathological lesions (n=300)

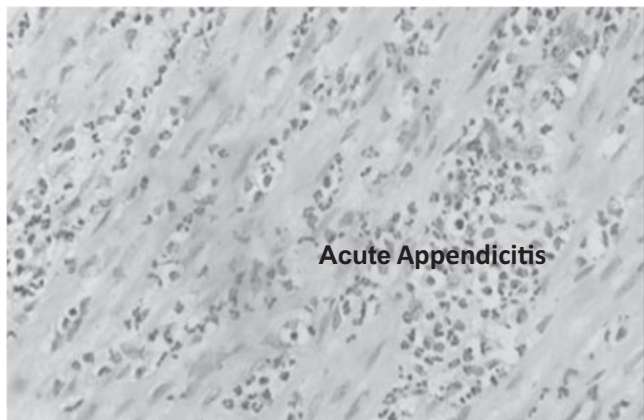


Figure-1. Inflammatory exudates in Acute appendicitis (H& E x100)

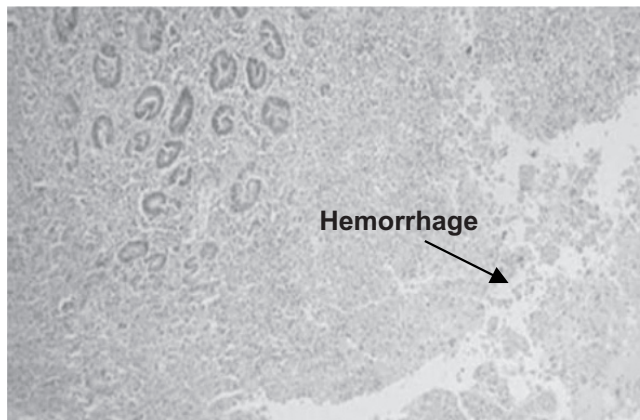


Figure-2. Inflammatory exudates showing hemorrhage and necrosis (H& E x100)

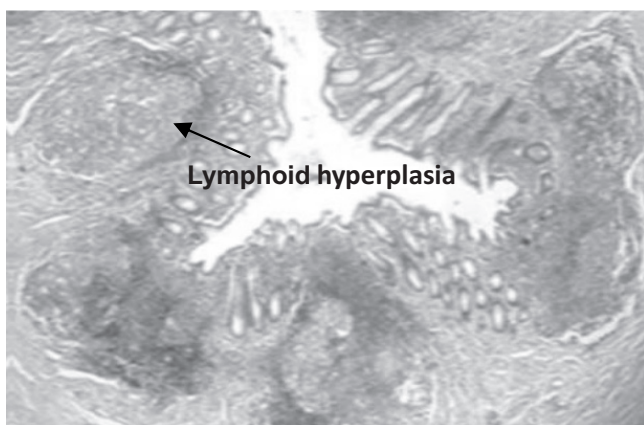


Figure-3. Lymphoid hyperplasia seen in the acute appendicitis (H& E x100)

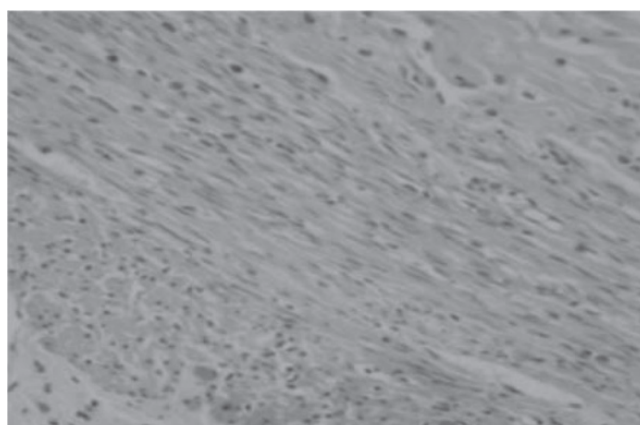


Figure-4. Enterobius vermicularis is seen in the Appendicular lumen & wall (H& E x200)

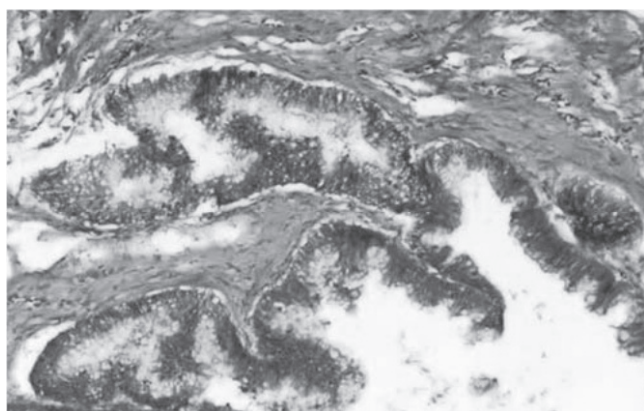


Figure-5. Mucin secreting neoplasm with submucosa invasion (H & E) (x100)

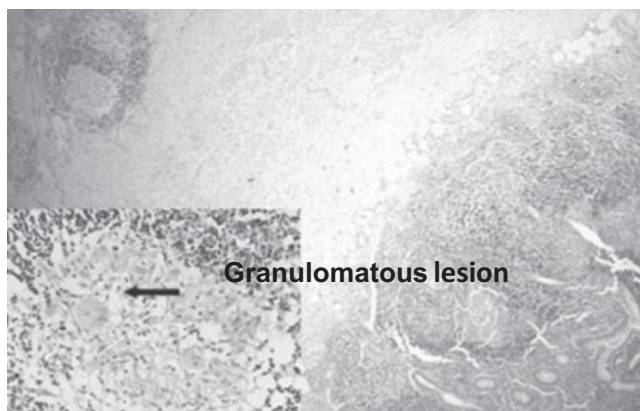


Figure-6. Chronic caseating granuloma (H& E) (x400)

DISCUSSION

The present prospective observational study reports on unusual incidental histopathology findings in appendectomy specimens from our tertiary care hospital. Acute appendicitis is a surgical emergency and mainstay of treatment is the appendectomy, but more important is

it's histopathological examination to diagnose unusual grave pathology.^{9,10} For example the clinical management of tuberculosis and parasitic appendicitis are different, so is the case of malignant disease, Crohn`s disease, adenocarcinoma, carcinoid tumors, etc. It is reported that 40% of all surgical procedures

accounts for the appendectomy in the Western countries. Due to increasing health facilities and expertise of diagnosing the disease process, an increasing trend of acute appendicitis diagnosis is reported from the urban areas of developing countries.⁹ In majority of appendectomy specimens, an acute inflammatory process is the underlying pathological process; however, other hidden pathologies may be there that might endanger the patient's lives. Lymphoid hyperplasia and fecolith occlude the appendix lumen. Obstruction of lumen builds pressure on blood vessels with resultant ischemia and proliferation of bacteria of enterococci species within it.⁹ About 7% of general population suffers appendicitis with peak incidence in first 3 decades of life.⁹ Histopathology of appendectomy specimens helps in proper diagnosis of unusual incidental findings for proper timely intervention.¹⁰ In continuity to this, the present study reports various unexpected incidental findings in appendectomy specimens by histopathological examination such as; adenocarcinoma, carcinoid tumors, Crohn's disease, worm infestation (*E. vermicularis*) and endometriosis. These unusual findings are of importance because their clinical management differs. These findings are consistent with a previous studies.¹¹⁻¹⁴ We found young age and male dominance which is in agreement with previous studies.¹²⁻¹⁴ In present study, of total 300 specimens, male and female were 235 (78.33%) and 65 (21.66%) respectively. Male to female ratio was 3.61:1 ($P=0.0001$), this is in keeping with previous studies.^{11,12} Our findings of acute, sub-acute, chronic, recurrent, obliterative noted in; 57.66%, 4.33%, 8.66%, 3.33%, 11.3%, 7.66% and 7.66% of cases respectively, are consistent with previous studies.¹⁵⁻¹⁷ However, perforation incidence of 25.33% is higher compared to previous studies,^{11,12} and this is because of late health seeking behavior of public and avoiding of disease for prolonged duration till the disease process progresses to advanced stages. Late health seeking behavior is because of poor socio-economic conditions and health provision facilities. In present study, the fecolith was noted in 34.33% of cases that is similar to a previous study,¹¹ which reported 40% incidence of fecolith. Suppurative and gangrenous appendectomy

specimens were noted in 7.66% each that is consistent to reported studies.¹⁵⁻¹⁷ Tuberculosis causes granulomatous inflammation which was high in present study compared to very low 0.1-0.6% as reported previously.¹⁸ The only limitation of present study is small sample size, hence generalization should be cautious for other settings. The present study emphasizes importance of histopathological examination of appendectomy for proper diagnosis and timely intervention for uncommon disease such as Crohn's disease, carcinoid tumors and adenocarcinoma.

CONCLUSION

The present prospective study reports high frequency of acute appendicitis, peri-appendicitis, perforation, lymphoid hyperplasia, granulomatous inflammation and fecolith. Crohn's disease, carcinoid tumors, adenocarcinoma, endometriosis and *Enterobius vermicularis* were few unusual findings. The present study emphasizes that each of appendectomy specimen resected and removed by a surgeon must be analyzed by a histopathologist for unusual disease process.

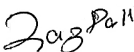

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Sr. #	Author-s Full Name	Contribution to the paper	Author=s Signature
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2	Abdul Aziz Shaikh	Statistical analysis, Manuscript write up, Proof Reading, Biochemical analysis, Manuscript write up, Proof reading.	
3	Manzoor Ali Shaikh	Concept, Materials handling, manuscript write up, Biochemical analysis and laboratory testing, compilation of results, Proof reading.	